



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/767,390	01/29/2004	Gregory Eric Howard	TI-34133	4753
23494	7590	03/09/2005	EXAMINER	
TEXAS INSTRUMENTS INCORPORATED P O BOX 655474, M/S 3999 DALLAS, TX 75265			MALSAWMA, LALRINFAMKIM HMAR	
			ART UNIT	PAPER NUMBER
			2823	

DATE MAILED: 03/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/767,390	Applicant(s) HOWARD ET AL.	
	Examiner Lex Malsawma	Art Unit 2823	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 December 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22 is/are pending in the application.
- 4a) Of the above claim(s) 11-22 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 January 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group I (claims 1-10) in the reply filed on December 20, 2004 is acknowledged.
2. Claims 11-23 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made **without** traverse in the reply filed on Dec. 20, 2004.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Art Unit: 2823

5. Claims 1 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tsukamoto et al. (4,931,897; hereinafter "**Tsukamoto**") in view of Jung et al. (6,309,925 B1; hereinafter "**Jung**").

Regarding claim 1:

Tsukamoto discloses (in Figs. 1A-1E) a method of producing a capacitor comprising:
forming a first plate 3 of the capacitor, said forming further comprising:

depositing a layer of polysilicon 3 over an isolation layer 2, the isolation layer being formed on a substrate (Col. 4, lines 37-40);

amorphizing the polysilicon layer 3 (Fig. 1B and Col. 4, lines 49-59);

depositing a dielectric 4 over the first plate 3 (Fig. 1D); and

forming a second plate 6 of the capacitor over the dielectric layer (Fig. 1E).

Tsukamoto **lacks** siliciding the exposed surface of the polysilicon layer. Jung **teaches** a process for forming a capacitor structure, similar to that disclosed by Tsukamoto, wherein Jung teaches that the first plate (i.e., the bottom electrode 204a, note Figs. 2A-2B) is silicided in order to decrease the resistivity of the first plate such that operating speed and frequency of the capacitor can be increased (note Col. 2, lines 30-36). It would have been obvious to one of ordinary skill in the art to modify Tsukamoto by siliciding the first plate (as taught by Jung) because such a modification could significantly improve the operating speed and frequency of the capacitor.

Regarding claim 7:

Tsukamoto discloses (in Fig. 2 and Col. 4, lines 56-59) the exposed surface to the amorphized polysilicon is substantially smooth relative to polysilicon.

Art Unit: 2823

6. Claims 2, 3 and 5 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Tsukamoto** (in view of **Jung**) as applied to claim 1 above, and further in view of Chang et al. (6,037,204; hereinafter "**Chang**").

Regarding claims 2 and 3:

Tsukamoto (in view of **Jung**) **lacks** the amorphizing further comprising implanting a neutral species in the polysilicon layer. However, note that **Tsukamoto** discloses implanting arsenic (As) into the polysilicon layer 3 (Col. 4, lines 50-54). **Chang teaches** that combining a neutral species such as Si with a dopant species such as As (during an amorphizing step applied to a polysilicon layer) facilitates a silicide phase transition, prevents microvoids from forming, and permits As to be implanted at a lower dose (see last two sentences in the abstract). Therefore, it would have been obvious to one of ordinary skill in the art to modify **Tsukamoto** (in view of **Jung**) by incorporating a neutral species such as Si during the amorphizing step (as taught by **Chang**) because such a modification could significantly improve the silicidation process, e.g., by preventing microvoids from forming.

Regarding claim 5:

Chang discloses (in Col. 5, lines 8-11) the neutral species is implanted at a dose of about 10^{15} atoms/cm² to a depth of about 600 Angstroms.

7. Claims 4 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Tsukamoto** (in view of **Jung**) as applied to claim 1 above, and further in view of **Chang** (6,037,204) and **Chong et al.** (6,335,253 B1).

Regarding claim 4:

Initially, this claim is similar to claim 3 except that, in the instant claim, the neutral species is specifically chosen to be germanium. Tsukamoto (in view of Jung and Chang) disclose the claimed invention **except** for specifically utilizing germanium as the neutral species (note above, *Regarding claims 2 and 3*, for a detailed explanation). Chong et al. is **cited to show** it was well known in the art that germanium (Ge) can be used instead of silicon (Si) when performing an amorphization process. Chong et al. discloses (in Col. 5, lines 22-25) that Ge (or Ar) is interchangeable with Si when performing the amorphization process. Therefore, it would have been obvious to one of ordinary skill in the art to modify Tsukamoto (in view of Jung and Chang) by utilizing Ge instead of Si during the amorphization process because Chong et al. shows that Ge can be readily substituted for Si during such a process. In other words, using Ge instead of Si would have been an obvious matter of selecting a known material substitute on the basis of its suitability. Note that it has been held to be within the general skill of a worker in the art to select a known material (Ge) on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

Regarding claim 6:

None of the cited references specifically discloses an implantation energy of about 100 KeV; however, Tsukamoto, Chang and Chong et al. disclose an implantation energy of about 50 KeV, wherein the implantation energy is associated with a depth of about 600 Angstroms (note Tsukamoto, Col. 4, lines 50-53; Chang, Col. 5, lines 8-11; and Chong et al., Col. 5, lines 38-44). Since the current claim does not provide any particular limits to a thickness for the polysilicon layer or to a depth of implant for the amorphizing species, it would have been readily obvious to

one of ordinary skill in the art to modify Tsukamoto (in view of Jung, Chang, and/or Chong et al.) by specifically implanting at an energy of about 100 KeV because the energy of implant would only be limited by the thickness of the polysilicon layer or by a desired depth of implant, and since no limits are specific in the currently claimed invention, one could obviously utilize an implant energy of 100 keV, 200 KeV, 75 KeV, etc. depending on a specified thickness for the polysilicon layer. In other words, the concepts for ion-implanting a dopant/neutral species are very well known in the art, e.g., implanting at a higher energy directly results in a deeper implantation depth; and given some specified thickness for a polysilicon layer, which is to be amorphized, one of ordinary skill in the art could easily find an optimum or workable range for the implantation energy. In sum, the instant claim is held obvious over the cited references primarily because the cited implantation energy is considered to be an optimum or workable range that is applicable for a thickness range chosen for the polysilicon layer, wherein given any specific range in thickness for the polysilicon layer, one of ordinary skill in the art would be able to arrive at an optimum range for an appropriate implantation energy.

8. Claims 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Tsukamoto** (in view of **Jung**) as applied to claim 1 above, and further in view of Collins et al. (US 2004/0107909 A1; hereinafter "**Collins**").

Regarding claims 8-10:

Tsukamoto (in view of Jung) **lacks** amorphizing by ion bombardment in a PECVD or etching chamber. Note that Tsukamoto utilizing ion implantation, which typically incorporates an ion-implantation apparatus. Collins **teaches** that plasma immersion overcomes limitations

Art Unit: 2823

associated with typical ion-implantation apparatuses (note paragraphs 0004-007), wherein Collins discloses a plasma immersion apparatus suitable for amorphizing a crystalline substrate, where the amorphizing ion is generated from a heavy ion carrying gas including argon and xenon (note paragraph 0320). It would have been obvious to one of ordinary skill in the art to modify Tsukamoto (in view of Jung) by incorporating a plasma-immersion apparatus (as taught by Collins) and ion bombarding the polysilicon layer instead of ion-implanting with a typical ion-implantation apparatus because such a modification would avoid the limitations presented by a typical ion-implantation apparatus.

Conclusion

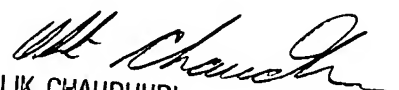
9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lex Malsawma whose telephone number is 571-272-1903.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Olik Chaudhuri can be reached on 571-272-1855. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Lex Malsawma
March 4, 2005




OLIK CHAUDHURI
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800